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No. of printed pages : 03

SARDAR PATEL UNIVERSITY

B. Sc. (Second Semester Examination)

Saturday, 2nd April,

2016

10.30 a.m. to 12.30 p.m.

US02CCHE01 - ORGANIC CHEMISTRY

Total Marks : 70

Note : (i) All questions are to be attempted. (ii) Figures to the right indicate marks.

- Q.1 Choose the correct option for the following :** [10]
- (i) How many isomeric products will be obtained upon monobromination of n-pentane ?
 (a) 2 (b) 3 (c) 1 (d) 4
- (ii) Initiation step for the photochemical halogenations of alkane is
 (a) exothermic (b) endothermic (c) both "a" & "b" (d) none of these.
- (iii) For open chain n-alkane, the heat of combustion per $-\text{CH}_2-$ unit is Kcal.
 (a) 158.7 (b) 166.6 (c) 164.0 (d) 157.4.
- (iv) Addition of HBr in presence of peroxide to 1-propene follow rule.
 (a) markovnikovs (b) anti-markovnikovs (c) satyzeff (d) none of these.
- (v) The reagent for syn-hydroxylation of cycloalkene is
 (a) HCOOOH (b) cold alkaline KMnO_4 (c) NaIO_4 (d) hot alkaline KMnO_4
- (vi) Which of the following compound give acetic acid and acetone upon oxidation in presence of hot alkaline KMnO_4 ?
 (a) 2-butene (b) 2-methyl-2-butene
 (c) 2-methyl-2-pentene (d) none of these.
- (vii) The rate of $\text{S}_{\text{N}}1$ reaction depends upon the concentration of
 (a) both substrate & nucleophile (b) nucleophile
 (c) substrate (d) none of these.
- (viii) Neopentyl bromide undergo $\text{S}_{\text{N}}2$ reaction in presence of NaOEt to produce ...
 (a) ethyl neopentyl ether (b) ethyl tert pentyl ether
 (c) both "a" & "b" (d) none of these.
- (ix) In chlorobenzene, chlorine located on benzene ring withdraw electrons through its effect.
 (a) resonance (b) Inductive (c) both "a" & "b" (d) none of these
- (x) Which one of the following is used as a catalyst in Clemmensen reduction ?
 (a) $\text{NH}_2\text{NH}_2/\text{KOH}$ (b) Zn/Hg , conc. HCl (c) NH_2NH_2 (d) none of these

P.T.O.

Q.2 Answer the following (Attempt any ten) :**[20]**

- (i) Define : (a) Bond dissociation energy and (b) Free radical.
- (ii) Write reaction of Cyclopropane (a) with Cl_2 in presence of FeCl_3 and (b) Cl_2 in presence of light.
- (iii) What is Grignard reagent ? What are its uses and limitations ?
- (iv) Explain : Acetylene is stronger acid than ethane.
- (v) Discuss keto-enol tautomerism using suitable illustration.
- (vi) Explain : Cis-2-butene is less stable than trans-2-butene.
- (vii) Write reaction mechanism for $\text{S}_{\text{N}}2$ reaction using suitable illustration.
- (viii) Explain : 2-Bromo-3-methylanisole does not react with $\text{NH}_2^- / \text{NH}_3$ via elimination-addition mechanism.
- (ix) Write all the possible isomeric structural formula and IUPAC name for the compound having molecular formula $\text{C}_4\text{H}_9\text{Cl}$.
- (x) Distinguish between halogenation of alkyl benzene in presence of light and in presence of catalyst.
- (xi) Draw the structure of cyclopentadienyl cation, anion and radical. Amongst them, which one follow Huckel rule ?
- (xii) What are the limitations of Friedel-Crafts alkylation ?

Q.3

- [A]** Write structural formula for the following : **[4]**
 - (i) Bicyclo[6.1.0]nonane. (ii) Nortricyclene
 - (iii) Bicyclo[1.1.1]pentane (iv) Bicyclo[3.2.1]octane
- [B]** Write the synthesis of 3-methylheptane using sec.-butyl chloride and any required reagents by following Corey-House synthesis. Also differentiate between Corey-House reaction and Wurtz reaction. **[3]**
- [C]** Monochlorination of n-propane give 1-chloropropane and 2-chloropropane in 44 % and 56 % respectively. Calculate relative reactivity of concerned hydrogens. **[3]**

OR**Q.3**

- [A]** Discuss Baeyer's angle strain theory using the concept of angle strain and orbital picture of covalent bond. Also discuss its successful and unsuccessfulness. **[4]**
- [B]** Define chain reaction. Write reaction mechanism for the photochlorination of ethane. **[3]**
- [C]** Calculate the percentage of isomeric products obtained upon monochlorination of 2,3-dimethyl butane. The relative reactivity of 1° , 2° and 3° H are 1: 3.8: 5 respectively. **[3]**

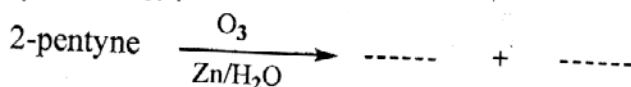
- Q.4** Define electrophile and nucleophile. Write reaction mechanism for the addition of (i) HBr , and (ii) $\text{Br}_2 / \text{H}_2\text{O}$ to ethylene. **[10]**

Also do as directed for the following :

- (iii) Synthesis of 1-propyne from 1-propene using Br_2 , alc. KOH & NaNH_2 .

PTO

- (iv) Synthesis of 2-pentyne from acetylene using LiNH_2 & required RX.
 (v) Predict the product for :



OR

- Q.4** Discuss kinetics and mechanism for E1 and E2 reactions. Enlist their evidences and show that E2 reaction mechanism shows absence of hydrogen exchange. Also prove that *neopentyl* bromide upon E1 elimination gives 2-methyl-2-butene as a major product. [10]

Q.5

- [A]** Write reaction mechanism for the formation of aniline from chlorobenzene via benzyne intermediate in presence of $\text{NH}_2^- / \text{NH}_3$. [3]
[B] Explain : Chloro benzene and vinyl chloride are less reactivity towards nucleophilic substitution reaction compare to ethyl chloride. [3]
[C] Arrange the following molecules in the increasing order of reactivity towards $\text{S}_{\text{N}}1$ reaction and justify your answer. [4]
 (i) ethyl chloride (ii) *t*-butyl chloride (iii) Isopropyl chloride.

OR

Q.5

- [A]** Define homolytic and heterolytic reaction giving an illustration. Discuss Frank Whitmore rearrangement for 1,2-alkyl and 1,2-hydride shift. [4]
[B] Explain : Hydrolysis of *p*-nitroacetanilide is best carried out in acidic medium and not in a basic medium. [3]
[C] Define carbocation. Discuss the structure of carbocation and relative stabilities of various carbocations. [3]

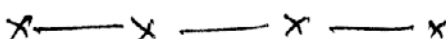
Q.6

- [A]** For the following molecular formula of aromatic compounds, write the name and structural formula : [4]
 (i) C_8H_{10} (ii) $\text{C}_6\text{H}_6\text{O}$ (iii) $\text{C}_7\text{H}_6\text{O}_2$ (iv) C_7H_8
[B] Explain : Nitrobenzene upon further nitration gives *m*-dinitrobenzene as a major product and not *o*- and *p*-dinitrobenzene. [3]
[C] Outline synthesis for the following : [3]
 (i) Phenyl acetylene from ethyl benzene.
 (ii) Ethyl cyclohexane from styrene.

OR

Q.6

- [A]** Write reaction mechanism for the sulphonation of benzene. [4]
[B] Write synthesis of *m*-nitrobenzophenone from toluene via Friedel-Crafts acylation reaction. [3]
[C] Give structural formula, molecular formula and IUPAC name for the following : [3]
 (i) Benzyl alcohol (ii) Phthalic acid.



(3)